



Pulmonary hypertension due to diastolic dysfunction

A predictive model using the National Echo Database of Australia



K. Chung¹, D. Playford¹, D. Celermajer², J. Codde¹, G. Scalia³, G. Strange¹ - (1) The University of Notre Dame, School of Medicine, Perth, Australia (2) University of Sydney, Sydney, Australia (3) University Of Queensland, Brisbane, Australia ** Authors have no conflicts of interest

Background

Left heart disease (LHD) is the commonest cause for pulmonary hypertension (PH), and diastolic dysfunction is the dominant pathophysiology. The National Echo Database Australia (NEDA) is an Australian multicenter systematic database of patient echo parameters.

Methods

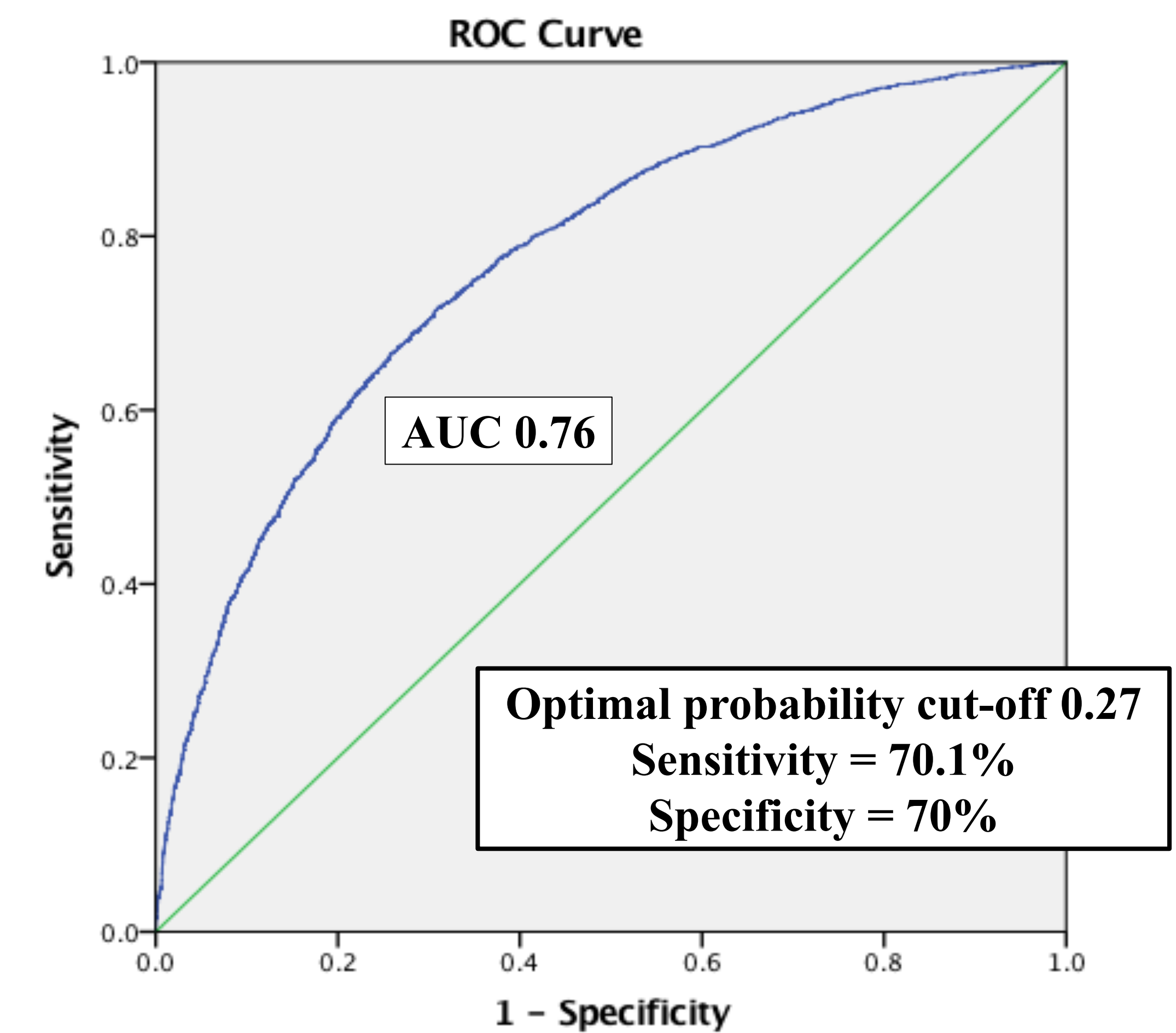
302,746 echos (174,229 patients >18 years) were included in this cohort. PH (ePASP >40mmHg) was estimated using TR velocity (TRV). The diastolic markers most significantly associated with PH were identified using univariate analysis. The entire cohort was then randomized to two groups: Group A (151,373 echos) to perform multivariate logistic regression analysis on the identified diastolic markers, to establish a novel predictive model; Group B to validate the predictive model on the remaining group (151,373 echos). A nomogram was formulated to predict the PH probability based on diastolic markers.

Results

75,204 patients (43%) had insufficient TR to measure ePASP. Of the 99,025 remaining patients with TRV present,

19,767 (20%) had an ePASP > 40 mmHg. 11,988 (61%), 4,610 (23%) and 3,169 (16%) had mild (40-49mmHg), moderate (50-60mmHg) and severe (>60mmHg) PH, respectively. Age, E' velocity (cm/s), E/e', E:A ratios, indexed left atrial volume (LAVI) and ejection fraction were significantly ($p < 0.00001$) different in patients with PH vs those without (80,273 patients). Using multivariate logistic analysis, Group A (using our diastolic predictors for PH) produced an area under the ROC curve of 0.746. When the same logistic regression equation from Group A was applied to Group B, the area under the ROC curve was 0.757. A nomogram was then formulated to allow clinicians to predict the probability of PH based on diastolic markers in echocardiography.

N=99,025	PASP <40mmHg (mean +/- SD)	PASP > 40mmHg (mean +/- SD)	P-value
Age (years)	62 (17)	76 (12)	< 0.00001
PASP (mmHg)	29 (6)	51 (11)	< 0.00001
E' septal velocity	8.2 (3.0)	6.7 (2.6)	< 0.00001
E:E' ratio	10.7 (5.0)	16.7 (8.3)	< 0.00001
E:A ratio	1.2 (0.6)	1.3 (0.8)	< 0.00001
Left atrial volume index	33 (13)	46 (20)	< 0.00001



Conclusion

PH is common (20% of large multicenter echo database). Age, e', E/e', LAVI and E:A ratio are associated with PH. From these variables, we could predict PH with 75% accuracy, including echos without a measurable TR velocity. Our nomogram may be a useful clinical tool in identifying PH due to LHD.

